PROCESSING A REQUEST TO AN OPERATOR SERVICE

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02102 which was filed in the German language on January 4, 2001.

TECHNICAL FIELD OF INVENTION

The invention relates to a method of processing requests directed to an operator service of a telecommunication network, and in particular, which are received in the form of a request for connection from a calling subscriber of the network for the operator service.

BACKGROUND OF THE INVENTION

In telecommunication networks, what are known as operator services are typically provided. These services often represent an important link between the customers of the network and the network operators. The tasks of such an operator service are many and varied. A main task, for example, is to provide the subscribers with information on request. A subscriber wishing to use an operator service requests the setting up of a connection to the operator service, for example in a telephone network in the form of a call by means of a service number assigned to the operator service. On the part of the operator service, the request for connection is accepted and the desired service is provided for the calling subscriber.

Also known in current communication networks or telephone networks, along with the connection of private branch exchanges to public exchanges, is the interconnection of a number of subscriber lines arranged in the telephone network to form a subscriber group, for example performing the function of an

operator service - also known as a "hunting group". A hunting group is assigned a group call number or pilot call number, which is shared by all of the interconnected subscriber lines. After it has been dialed - for example for the setting up of a communication link to one of the communication devices assigned to the group - a free subscriber line within the group is determined with the aid of a defined search method - also referred to as a "hunting algorithm" - for setting up the connection.

For example, a subscriber may call an operator service in an ISDN network in order to request information and a connection concerning another subscriber. The subscriber is assigned to a free operator and obtains from the latter the requested service, for example the desired information. The responsible operator can then, if necessary, access a database for example, the operator then being provided on the screen of his PC with information concerning the other subscriber. If also desired, the operator can set up a connection with the desired subscriber and put the latter through to the calling subscriber. The example just described is intended to represent only one of the possibilities or tasks of an operator service.

A system for carrying out an operator service comprises not only a central control system but also the assigned operators. The control system and the operators are usually stationed at 'call centers', and their respective equipment, comprising a terminal, PC, screen etc. and referred to usually and hereafter as a "console", is directly connected or configured for connection to the system. For example, a call center may be established as part of one of the applicant's EWSD switching systems, the operators being connected as network subscribers. Another known embodiment of a call center is set up for example in the central

station of a branch exchange, the operators or the subscribers assigned to the operator service being reachable via extensions. The branch exchanges are connected via a predetermined number of connection lines or transmission channels to the higher-level or public communication network.

Since the number of operators of a given operator service is limited, typically for reasons of economy, there is often the situation - at peak times - that all the available operators are already busy attending to calling subscribers. Consequently, when another subscriber calls for the operator service, no operator is free to take the call. Since in such a case the request is usually not handled like a request for connection to a busy line - that is rejection with a busy signal of the telecommunication network - a waiting procedure is provided for the request received.

A conventional method for a waiting procedure, in particular in the case of telephone services, consists of the request or the call being made to wait on-line; the calls waiting on-line are taken by operators one after the other. The calling subscriber must remain on the phone for the entire time until his call is taken. Owing to long waiting times, the call is often terminated prematurely by the often irritated subscriber. This may lead to a lack of acceptance of the service and, as a consequence, to actual dissatisfaction on the part of the customers with the operator of the service.

Another solution is to reduce the waiting time at especially busy times by assigning additional operators to the service. However, apart from the associated administrative effort, this solution requires an adequately large number of operator personnel to be available.

Within current telephone networks, the signaling for setting up and clearing down 64 kbit user information connections for controlling ISDN services takes place on the basis of the ITU-T Signaling System No. 7 - also referred to as SS No. 7.

The actual task of the Signaling System No. 7 is to exchange signaling messages within the communication networks. The signaling messages are exchanged by the user parts within the reference model. According to the type of signaling messages, a distinction is made, for example, between the Telephone User Part - TUP -, the Data User Part - DUP -, the ISDN User Part - ISUP - and the Broadband ISDN User Part - B-ISUP. The TUP was implemented as the first application in the Signaling System No. 7. Building on the TUP, the ISUP was defined for generally establishing the ISDN and for establishing the signaling within the ISDN. The ISUP gave rise to the latest application of the B-ISUP for applications within ATM-based networks. The main tasks of the ISUP are:

- setting up and clearing down user information connections,
- performing the signaling for service attributes,
- coupling two "logical" signaling connections (for example at the transition from the national network to the international network).

The ISDN user part directly uses the Message Transfer Part - MTP - and the Signaling Connection and Control Part - SCCP, layer 4; the ISUP itself is consequently to be classified as belonging to layers 4 to 7 in the OSI reference model. The ISDN user part controls both the link-by-link signaling to reach the destination and the end-to-end signaling relationship between the originating exchange and the destination exchange.

With the aid of the link-by-link signaling, the path for the user information connection and the signaling connection is sought and, after corresponding commands, is set up. The MTP is used for this purpose. For the user information connection, all the involved exchanges must be informed, for example by switching through the user information channel, while only the originating and destination exchanges exchange signaling information for the control of the service attributes. For the end-to-end signaling, the ISUP uses the services of the SCCP. In the ISDN user part, the actual signaling information is exchanged. All the lower-level layers ensure that this information is transmitted in an acknowledged form and reaches the addressed user part. For the exchange of the end-to-end signaling messages for handling ISDN service attributes, the end-to-end signaling of the SCCP is used, based on a TCAP dialog.

For more complex applications within communication networks, such as for example for supporting database inquiries pertaining to services of the Intelligent Network - also referred to as IN - or in the case of mobile radio applications, the Transaction Capabilities Application Part - TCAP - was introduced into the Signaling System No. 7. For example, with the freephone service of the Intelligent Network, the initiator of the connection dials an IN call number (0130 or 0800), which, by calling up the Intelligent Network, determines a destination call number on the basis of the customer parameters. For determining the valid destination call number, only signaling messages have to be exchanged; the user information channel is not connected to the IN. This service call is an example of a typical TCAP application. In the communication of TCAP entities, a distinction is made between structured dialog and unstructured dialog. In the case of structured transport, before messages are

exchanged, a transaction relationship is initiated and the transaction code - also referred to as the transaction ID - is allocated in both communication devices of the two signaling nodes involved for the identification of this relationship. After a BEGIN message, in the structured dialog the individual information is transferred with CONTINUE messages. The BEGIN message contains the transaction code of the initiator, the CONTINUE messages contain, depending on the direction of transmission, the code of the initiator or the code of the communication partner as the originating code and the code of the communication partner as the destination code. Once the information has been transmitted, the dialog is ended in the normal way by the END message. Structured dialog is used for example for database inquiries, such as for example in the mobile radio networks or in the IN; all exchanged messages can be identified as belonging to this activity by the transaction code.

SUMMARY OF THE INVENTION

The invention discloses a waiting procedure in which, with reasonable expenditure and also with a predetermined number of operators, the waiting time of calling subscribers is passed in a more acceptable way than in the case of the known methods.

The invention is achieved in one embodiment by a method in which the waiting procedure to which a request is subjected is carried out according to the invention as follows:

an entry is generated as a call-back entry with information which contains a call address concerning the calling subscriber and/or information representing the calling subscriber and is arranged in sequence in a waiting field, the request or a connection arising from it being terminated, and when an operator or a connection line becomes free, at least one of the first

entries in the waiting field is taken from the waiting field and, on the basis of the information of the at least one entry, a call-back connection is established between the subscriber specified by the call address and the free operator or the free connection line.

The calling subscriber can leave his request to use the service without having to "hang on" during the entire waiting time. In addition, the call charges which would arise during this waiting time do not apply.

According to another embodiment of the method according to the invention, the waiting procedure is carried out as follows:
An entry is generated as a call-back entry with information which contains a call address concerning the calling subscriber and/or information representing the calling subscriber and is arranged in sequence in a waiting field, the request or a connection arising from it being terminated.

At least one of the first entries in the waiting field is taken from the waiting field and, on the basis of the information of the entry, a call-back connection directed at the subscriber specified by the call address is initiated and is possibly maintained. Subsequently, the call-back connection is established between the specified subscriber and a free subscriber or a free connection line. In this implementational variant, possibly occurring waiting times for the operators are avoided, since the waiting subscriber is called back already before an operator actually becomes free and, if need be, is connected to an announcement. When a suitable operator becomes free, the already called-back subscriber is immediately put through.
In still another embodiment of the invention, at the beginning of the waiting procedure for the request concerned, an anticipated waiting time is determined

and, provided that it lies above a predeterminable lower threshold value, a call-back entry is generated, otherwise the request is arranged in sequence in the waiting field. This avoids the generation of a call-back in the case of short waiting times, when the subscriber is quite willing to wait.

In addition if, at the beginning of the waiting procedure for the request concerned, an anticipated waiting time is determined and, provided that it lies below a predeterminable upper threshold value, a call-back entry is generated, otherwise the request is denied. This procedure is useful wherever the waiting time would become so great, for example several hours, that waiting for the call-back would presumably be onerous or pointless for the subscriber.

It is preferable if, before terminating the request or the connection arising from it, service-specific instructions are taken from the calling subscriber and used when generating the call-back entry and/or arranging it in sequence.
Service-specific instructions may in this case be, for example, the selection of an operator group, such as for example for a subservice (for example division of the foreign information service into subservices corresponding to geographical areas); they may concern special service features, such as for example a language desired by the subscriber for the services provided or a customer number of the calling subscriber, which could be used for example in the selection of an operator. The instructions may have been provided by the subscriber in a connection arising from the request, for example in an automated inquiry or as a suffix of the service call number dialed by the subscriber.

Furthermore, it is preferable if, at the beginning of the waiting procedure, instructions concerning the desired type of waiting procedure are taken from the calling subscriber, and a call-back entry is only generated if these instructions include consent of the subscriber to a call-back connection.

At the same time, to increase operating convenience, it is preferable if the instructions of the calling subscriber are taken in a voice-controlled dialog.

In yet another embodiment of the invention, more flexible handling of the call-back can be achieved if, when an operator becomes free, the first entry in the waiting field is taken from the waiting field, the information of the entry is supplied to the free operator and, on the basis of the information of the entry, the operator calls back the subscriber specified in it. The operator may initiate the call-back by pressing a button for example, whereupon the call-back connection is established, or the call-back connection is produced automatically by the console, without confirmation by the operator.

The instructions originating from the calling subscriber and concerning an operator selection are additionally used when generating the call-back entry, and, when taking an entry, those entries which include the free operator in their operator selection are considered. The instructions may be taken from the subscriber, for example as mentioned further above, or have been provided as a suffix of the call number dialed by the subscriber.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention together with further benefits is explained in more detail below on the basis of a non-restrictive exemplary embodiment, which concerns an

operator service of a fixed telephone network. Used as a basis for this explanation are the attached figures, which show schematic representations and in which:

Figure 1 shows the switching system for carrying out the operator service with the assigned operators.

Figure 2 shows the waiting field of the operator service.

Figure 3 shows a flow diagram of the generation of an entry of the waiting field.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An exemplary switching system OPS is shown in figure 1, on which the operator service is operated. The consoles of the operators OP1, OP2, OP3 assigned to the operator service OPS and the network subscribers TN1, TN2,...,TNx are connected into the fixed telephone network via subscriber lines and line trunk groups (not represented in the drawing), for example connected as shown to the switching unit KPN of the exchange. In the example, three operators are assigned to the operator service. Of course, there may be any desired number of operators. Provided for controlling the switching system OPS is a coordination processor COP, which also undertakes the assignment to the operators OP1, OP2, OP3 of the subscribers TNx calling with a service request.

A subscriber TNx wishing to use the operator service OPS requests this service by dialing a service call number which is assigned in the telephone network to the operator service. The request for connection received by the operator service consequently represents a service request. If one of the operators OP1, OP2, OP3 is free, the request is answered by the

request for connection being put through by the coordination processor COP to the free operator.

However, for purposes of this example, it will be assumed that all the operators OP1, OP2, OP3 are busy attending to service requests from subscribers - not shown in figure 1. Further service requests therefore cannot be handled immediately. Instead, they are subjected to a waiting procedure by the coordination processor COP. In known systems, for example, a recording, for example with the announcement "please wait", is played to the subscriber, and the request concerned is arranged in sequence in a waiting field WFD, usually at the end of the line created by the waiting field WFD. When an operator becomes free, the first request is taken from the waiting field and the subscriber is connected to the free operator.

According to the invention, it is provided that the waiting procedure is carried out on the basis of a request from a subscriber TNx for a (currently) busy operator service OPS as follows: an entry which is generated from call-relevant data of the subscriber TNx is arranged in sequence in the waiting field and the request for connection of the subscriber is terminated. The service request is answered by a separate call-back, which is initiated from the operator system when an operator becomes free on the basis of the call-relevant data in the first entry.

Figure 2 shows by way of example a waiting field WFD according to the invention with several entries, which are also referred to hereafter as call-back entries RRE. In the example shown, a call-back entry in each case includes a call number trn of the subscriber, from the service request of which the call-back entry originates. The call number trn serves as a call address when the subscriber is called back. A second

field opw of the entry designates a selection of the desired operators, for example for a desired language, for special subservices or the like. For the sake of simplicity, in figure 2 the operator selections opw in the entries are symbolized by figures, which relate to the number of the operators OP1, OP2, OP3. Additional information data included in an entry concerns additional data which have been provided by the subscriber on the basis of the operator service used.

Referring to the flow diagram of figure 3, if a request received by the operator service OPS as a result of a call of a subscriber TNx cannot be answered because the operators OP1, OP2, OP3 are busy, an automated dialog is first conducted with the subscriber, asking the calling subscriber to give service-specific instructions, for example for a subservice desired by the subscriber or desired service features, such as for instance a preferred language. The instructions are stored in a data field dat when an entry is generated and/or used for determining an operator selection opw, which indicates which of the operators OP1, OP2, OP3 is to answer the entry.

The anticipated waiting time before an answer can be given is then determined. This waiting time is determined by a predetermined method of a known type, for example on the basis of how busy the operator service is, in particular the number of requests waiting, and the processing time of previous service requests. If the anticipated waiting time lies below a predeterminable lower threshold value, for example below 2 minutes, the request is held in the known way as a waiting entry WTE in the waiting line, the calling subscriber TNx being informed by means of an automated announcement that his call will be dealt with shortly.

If, however, the anticipated waiting time exceeds the threshold value, a waiting procedure by means of a call-back takes place. A call-back entry RRE is generated using the call number tnx of the subscriber TNx and arranged in sequence in the waiting field WFD. The subscriber then receives an automated announcement that his request has been registered and he will be called back. Preferably, he may be additionally informed of the anticipated waiting time. The connection is subsequently terminated.

The arrangement in sequence rrh of the call-back entry generally takes place at the end of the waiting field. In special cases, an entry may also be arranged at some other position in the sequence, the position being determined for example on the basis of the subscriber data and the existing entries of the waiting list. For example, it could be provided that a specific group of callers is given preferential treatment and their requests or call-back entries are therefore arranged in sequence ahead of entries of other callers.

In addition to or instead of the already mentioned lower threshold value t1, a second, upper threshold value t2 may be provided. If the anticipated waiting time lies above the upper threshold value t2, for example over 3 hours, incoming service requests are denied, for example with an announcement which informs the subscriber that the service is busy and asks him to call back at a later time, and the creation of an entry for the waiting field does not occur.

In a variant (not represented in figure 3) of the invention, the decision with respect to the type of waiting procedure can be left to the calling subscriber. For example, the subscriber is informed in a voice-controlled dialog of the position in which he would be waiting in line and/or the probable waiting

time and is given the option of waiting in line, being called back or ending the call without any further action.

If one of the operators of the service OPS becomes free, for example the operator OP3, a suitable entry is taken from the waiting field WFD and answered. It may, for example, always be the first entry in the waiting field that is taken ent (figure 2). The waiting field WFD is advantageously searched through, beginning from the first position, for an entry which includes the free operator in its operator selection opw, and this entry is taken and used as a basis for the answer ent'.

In this example, the first entry with an operator selection which includes the operator OP3 (represented in figure 2 by the figure assigned to this operator, that is 3) is that entry with the call number tn3 of the subscriber TN3. (It is coincidental that the number of the operator is the same as that of the subscriber.) This entry is then taken from the waiting field and the information of the entry is supplied to the free operator OP3. On the basis of this information, the operator calls the subscriber TN3 back, for example by pressing a button on the console, whereby the establishment of a connection is initiated in a known way, and in this way offers the subscriber the desired service. In a variant, the call-back connection may be established automatically by the operator console and provided to the operator together with the information of the call-back entry.

To avoid waiting times for the operators, not only the entry position which is first in the waiting field but also the penultimate entry or a number of entries positioned first in the waiting field are advantageously taken from the waiting field and a call-back connection set up for each of them. Those entries

for which the still remaining waiting time within the waiting procedure is expected to be below a predeterminable threshold value, or a predetermined waiting time, are advantageously taken from the waiting field. The called-back subscribers are, for example, played an appropriate announcement, by which the end of the waiting procedure is indicated and the subscriber is switched through as soon as possible to the desired operator or subscriber.

The initiation according to the invention of a call-back connection to a specified subscriber as part of a waiting procedure provided in relation to an operator service represents in principle an advantageous development of the ISDN-specific "Call Completion on Busy Subscriber" service feature - also referred to as "CCBS" - specified according to the ETSI standard - cf. ETS 300 357 -, which however can be used for one subscriber line in each case.

The "Call Completion on Busy Subscriber" service feature is one of the most complex service features within ISDN-specific telephone networks. In the case of this service feature, a calling subscriber encountering a busy B subscriber line can have an automatic call-back initiated by the network when this subscriber is free again. In signaling terms, the unsuccessful connection to the B subscriber is initially terminated. In the destination exchange, the call-back request is then entered, it being determined by the destination exchange when the B subscriber is free again or has the free status. The determination of the free status can be achieved for example by regularly checking the switching status of the B subscriber. Alternatively, the transition of the subscriber status from "busy" to "free" may be selected or set as the triggering criterion for the initiation of the call-back. When the free status of the B

subscriber is established, it is firstly checked whether the A subscriber is likewise free, then the latter is called and after that a connection to the B subscriber is set up. The handling of the service feature - i.e. the checking of the B subscriber and the notification of the A subscriber - takes place as an end-to-end signaling between the two subscriber exchanges. The control of the service feature is supported for this on the SCCP end-to-end signaling connections and uses a TCAP-based dialog for the exchange of the end-to-end signaling data.

The method according to the invention represents a further development of the CCBS standard, the same procedures as CCBS being used for the signaling of the call-back information from the B subscriber to the A subscriber - i.e. the setting up of SCCP end-to-end signaling connections and exchange of end-to-end signaling data by means of TCAP dialog. By contrast with CCBS, other triggering criteria can be used in the case of the method according to the invention. With the aid of the method according to the invention, call-back connections can be created as part of a waiting procedure, it being possible to use for example the finding that the waiting time within a waiting line is less than expected as a triggering criterion for the initiation of a call-back connection. A service feature created in this way, i.e. initiation of a call-back to a specified subscriber if a waiting time is less than that predetermined, can also be referred to as "Call Completion on Dequeuing" or "CCDQ".

The method according to the invention may be used advantageously in the case of subscriber lines or connection lines arranged network-wide within a telephone network and combined to form a subscriber group. The subscriber group may be connected via a predetermined number of connection lines or

transmission channels - for example via a private branch exchange - to the public telecommunication network.